DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

MISCELLANEOUS FIELD STUDIES
MAP MF-1807

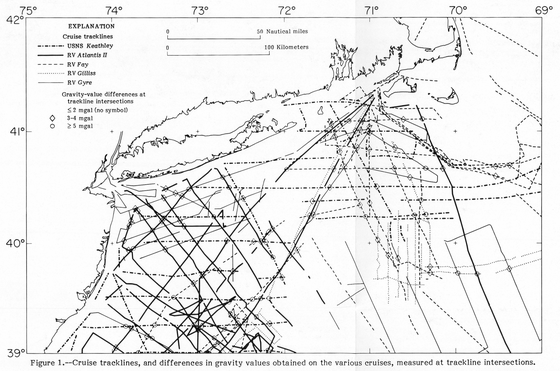

Figure 1.--Cruise tracklines, and differences in gravity values obtained on the various cruises, measured at trackline intersections.

EXPLANATION

-20 Free-air gravity contours, dashed where inferred. Primary contour interval 10 milligals; see text for explanation of 5-mgal contours. Hachures indicate closed areas of lower gravity

31 Maximum or minimum value (in mgals) within a contour closure

Data points. See text for explanation of variable spacing between points

100 Bathymetric contours, in meters

Providence
New Haven
New York City
Long Island
Atlantic City
NANTUCKET SHOALS
ATLANTIS CANYON
VEATCH CANYON
HUDSON CANYON

Mercator projection
Coastline from National Ocean Survey charts 12200, 12300

SCALE 1:492 250 AT LAT. 40°
30 NAUTICAL MILES
30 KILOMETERS

FREE-AIR GRAVITY ANOMALY MAP OF THE LONG ISLAND PLATFORM

By
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INTRODUCTION

The U.S. Geological Survey (USGS) has collected marine gravity data along the U.S. Atlantic continental margin during the last decade. This map of the Long Island platform combines the data used to make the preliminary free-air gravity anomaly map of the Atlantic continental margin (Grow and others, 1976) with new gravity values collected aboard the RV *Gillies* in 1979 and the RV *Gyre* in 1981.

Carl Bowin provided the USNS *Keathley* data from the Woods Hole Oceanographic Institution gravity data-base. We thank Bob Bowles (USGS) for his advice on editing the navigation and gravity data.

GRAVITY DATA

Because of the dense coverage of ships' tracks on the Long Island platform (Grow and others, 1976), only those data having high navigational accuracy are shown on the map. The data set includes gravity values obtained during cruises of five vessels (table 1 and figure 1). Navigation was by Loran-C fixes, either from the old East Coast 9930 chain or the current northern East Coast 9960 chain (table 1). Loran-C information from the RV *Fay*, *Gillies*, and *Gyre* cruises was integrated with satellite and gyrocompass information during data acquisition.

The raw data were acquired using either a Lacoste and Romberg platform gravimeter[1] (LaCoste, 1967) or a vibrating string accelerometer (Bowin and others, 1972). Free-air gravity values were calculated relative to the 1967 International Gravity Formula (Moritz, 1968). In the initial processing of data from individual cruises, gravity values were eliminated if: (1) profiles of the data showed scatter greater than 4-5 milligals (mgal), or (2) ship's maneuvering or other factors caused erratic Eotvos corrections. The accuracy of the data, based on the preliminary processing, ranges from ±2 mgal for RV *Gillies* and RV *Gyre* to ±3-5 mgal for USNS *Keathley* (table 1).

Compilation of the map required additional editing of gravity values at the intersections of tracklines from different cruises. If specific tracklines were characterized by excessive or consistent differences in gravity values, compared with those of intersecting tracklines, we eliminated the values of the suspect tracklines. In some instances, differences in values at trackline crossings in excess of 5 mgal could not be attributed to acquisition, navigation, or processing problems for either trackline; these values were left unchanged. The final map consists of about 12,000 data points and has more than 400 trackline crossings. Differences in the values obtained for each trackline at these points of intersection are categorized as: 74 percent within 0-2 mgal; 17 percent within 3-4 mgal; 6 percent within 5-6 mgal; and 3 percent within 7-12 mgal.

Individual data points are shown on the gravity map and represent gravity values obtained at 1-min or 5-min intervals during the survey. Closely spaced data points indicate a slow ship's speed rather than a more frequent sampling interval.

GRAVITY MAP

The accuracy of the data and the general agreement of line-crossing values justify a 10-mgal contour interval, and, in most areas, a 5-mgal interval. To take advantage of the 5-mgal information, but to show that it is near the limit of resolution of some of the data, we have drawn the 5-mgal contours as lighter lines. Contours near the shoreline were drawn to be consistent with values from gravity maps of the adjacent land areas (Bonini, 1965; Kane and others, 1972; Urban and others, 1973).

This new gravity map is an improvement over the previous one (Grow and others, 1976) in that it provides 5-mgal information. The details of the large positive and negative anomalies near New York City and the positive anomalies west of Nantucket Shoals are more clearly defined, as is the shape of the broad negative anomaly in the center of the platform. A small, negative anomaly (-2 mgal) exists in the center of the positive part of the shelf-slope anomaly and can be attributed to relief within the Hudson Canyon. The trends of the regional anomalies, that is, the shelf-slope paired anomaly along the edge of the continental margin and the positive half of the paired anomaly near New York City, are essentially the same on this and the earlier map.

[1]Use of trade names is for descriptive purposes only and does not constitute endorsement by the U.S. Geological Survey.

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Table 1.--*Summary of gravity data*

Ship[1]	Year	Gravimeter[2]	Navigation	Loran-C chain	Data accuracy
USNS *Keathley*	1968-1969	LGR	Loran-C satellite	9930	±3-5 mgal
RV *Atlantis II*	1975	VSA	Loran-C	9930	±2-3 mgal
RV *Fay*	1975-1976	VSA	INS[3]	9930	±2-4 mgal
RV *Gillies*	1979	LGR	INS	9960	±2 mgal
RV *Gyre*	1981	LGR	INS	9960	±2 mgal

[1]Cruise and legs:
RV Atlantis II-89-1,2,3
RV Fay-2,3,4,20,21,23,24,25
RV Gillies-3,4
RV Gyre-81-13,14

[2]Gravimeter:
LGR: LaCoste and Romberg platform gravimeter (LaCoste, 1967)
VSA: Vibrating string accelerometer (Bowin and others, 1972)

[3]INS: Integrated Navigation System (USGS)
Loran-C latitude and longitude fixes continuously updated by satellite fixes and gyrocompass information

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